NOTES ON AUSTRALIAN FOSSILS.

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(I.) NOTE ON SOME TRILOBITES NEW TO AUSTRALIA.

Lichas sinuata (1), n.sp.

(Plate XV. fig. 15.)

This beautiful fossil has been disengaged from blocks of limestone containing silicified fossils, collected near the Wellington caves. Unfortunately the heads, after having been detached from the stone by the use of hydrochloric acid, fell to pieces, and only a few pygidia remained perfect. The resemblance to *L. palmata*, Barr., is very strong. (See Barr. Syst. Sil. p. 599, pl. 28, fig. 9, and de Kon. Foss. Pal. Nouv.-Galles, &c. p. 57).

Lichas palmata is included by Barrande in his "Etage E, Faune III," and in his "Etage D, Faune II," where it formed colonies. In the Wellington limestone our species is accompanied by a small *Rhynchonella* which is very common, and resembles *R. Wilsoni;* and a Spirifer resembling *S. elevata* more than *S. crispa* is also very common.

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(1) Since the above was in type, I found in Quart. Journ. Geol. Soc. 1850, p. 235, the description of *Lichas hirsutus*, Fletcher, the pygidium of which is very similar to the Wellington fossil. However, from Pl. XXVII, bis, fig. 2, it will be seen that this species is very variable. It is from the Wenloch limestone of Dudley. In consequence of the deep sinuses which our fossil presents at the posterior angle of the lateral spines, considering it a distinct and new species, I suggest for it the name of *Lichas sinuata*.

The following are from Bowning, and were obtained by Mr. J. Mitchell, who has presented a number of specimens to the Australian Museum :—

PROETUS ASCANIUS, Cord. (?)

(Plate XV. figs. 1-4.)

Barr. Syst. Sil. pl. 15, figs. 41 and 42.

The specimens drawn are represented in Mr. Mitchell's collection by one specimen about 11 mm. long, and another about 17 mm., with other fragments of the same.

The head presents a character which I find also in *Proetus ascanius* represented in Barrande by the head only. While in all the other species represented, the distance between the extremity of the glabella and the front is small, and, at any rate, much shorter than the length of the glabella itself ; in the above and in the Australian species, this distance is exactly equal to the length of the glabella.

As to the pygidium, it resembles that of *P. decorus*, Barr. (pl. 17, fig. 13) but differs from this only by having eight costæ on each side of the axis instead of seven or less ; the axes are the same, and I think it hardly possible to distinguish a detached pygidium of that species from one of the Australian specimens. Fortunately two of these are nearly complete, and in the absence of a complete figure of *P. ascanius,* I must refer the species which has been obtained from Bowning, provisionally to *P. ascanius* with a (?.)

Barrande includes the last species in his "Etage F, Faune IV."

ACIDASPIS VERNEUILI, Barr.,

or

ACIDASPIS VESICULOSA, Beyr. (?)

(Plate XV., figs. 5-14.)

Barrande, Syst. Sil. Vol. I. pp. 710-715, pl. 38, figs. 1-6, 13-15 and 19.

Represented by a head, (figs. 5 and 7), and pleuræ separate.

The pygidium, which would enable one to distinguish between these two species, has not yet been found.

The pleuræ, however, although not complete, belong to a large specimen, and show remarkably well preserved ornaments, including some of the spines, and the spiny appendages adjacent to the long spines (fig. 9).

The representation of these specimens, therefore, was especially interesting in consequence of these details, but still more, as there seem to be traces of articulation between the axis and the pleuræ, a disputed point on which I will insist hereafter. The head does not belong to the same specimen as the pleuræ; the head corresponding to the same specimen as these last would be exactly one-half greater (× 1·5) in linear dimensions than the one represented, and the total length of the restored specimen from the front to the end of the pygidium, exclusive of the ornamental spines, would be nearly 120 mm. or about 4¾ inches. This is the largest size quoted by Barrande (l.c., p. 713) for *A. Verneuili*, while *A. vesiculosa* may attain to one-third more in size (× 1·33), or over 6¼ inches.

Our specimen belongs to the largest Trilobite hitherto recorded from Australia; the next largest forms I have seen, being probably some species of *Bronteus* and *Phacops* from the same locality.

This makes us more and more hopeful as to the richness of our Silurian fauna.

There are some few differences between the specimens alluded to, and Barrande's figures of *A. Verneuili* and *A. vesiculosa*; they are as follows:—

1. In the head the larger tubercles or spines do not seem to form nearly regular rows as in these species, a point rather difficult to decide in consequenee of the bad state of the specimen.

2. The rounded nodules which belong to the occipital ring although separated from it and placed at the back of each of the posterior lobes, are finely granulated without any addition of larger tubercles as in the figures given by Barrande.

3. In the thorax, the long spines which terminate the pleuræ are more distinctly arcuate than in the same figure of *A. Verneuili*.

4. The four larger tubercles on each of the pleuræ are regularly disposed as in the above, but show, what is not seen in Barrande's

figure, a ring of smaller tubercles on an elevated surface, from four to eight in number, around each of the four prominent ones (fig. 5 bis).

Now I come to the supposed articulation between the axis and the pleuræ as shown in our specimen.

Nearly fifty years ago, Emmrich in "De Trilobitis Dissertatio, &c." was of opinion that such an articulation existed, and he mentions *Ogygia Buchi*, and *Conocephalites Sulzeri.* Burmeister combated that opinion, and Barrande confirmed the views of the last except in the case of *Arionellus ceticephalus* (l.c., p. 166, pl. X., fig. 16.)

However, one cannot help being struck in examining the specimen in question, at the great resemblance to an articulation of the junction of the axis with the pleuræ. It seems as if the test (or its different joints) had been covered by a thin epiderm as admitted by Burmeister (Barrande l.c., p. 231), and that this epiderm is wrinkled at the articulations as shown in fig. 5, and especially in the enlarged sketch, fig. 8.

Locality : Bowning.

It may be added that *A. Verneuili* is included by Barrande in his "Etage E, Faune III," and *A. vesiculosa* in his "Etage F, Faune IV."

Acidaspis Verneuili.

(Plate XV. fig. 10.)

This species is also represented by a small pygidium 9 mm. in width, corresponding to a specimen 26 mm. long, the spines excluded. It has seven barbed spines.

The following specimens are more doubtful.

(Plate XV. fig. 11.)

A head with part of thorax corresponding to a specimen about $14\frac{1}{2}$ mm. in length, measures 12 mm. across from the origin of the genal points, and only 4 mm. from the front to the border of the occipital ring ; it is therefore three times broader than long. This character corresponds with broad cheeks and prominent eyes, and suggests *A. Prevosti*, (Barr. pl. 39). The occipital spines, however, are not seen.

(Plate XV. fig. 12.)

A small pygidium which has left its impression in a hollow, is only 6 mm. broad, corresponding to a little over 10 mm. from front to end, the spines not included. These are 12 in number, four between the principals, and three on each side. They, as well as the pygidium, are covered with numerous irregular tubercles. This and other characters correspond to *A. Prevosti*, (Barr. pl. 39, and Suppl. pl. 12.) But, having only figures to compare with, I can arrive only at doubtful conclusions. Thus the specimen in question shows that the two thickened parts of the principal spines on the limb of the pygidium are continued into a pad along the extreme border of the pygidium between these spines, and join in the middle the extremity of the axis, which is not the case in Barrande's figure. *A. Prevosti* is placed by Barrande in his "Etage E, Faune III."

(Plate XV. figs. 13 & 14.)

Two heads, one 12 mm. between the ocular lobes, the other a little smaller, and corresponding to individuals about 26½ mm. and 24 mm. respectively, are very much alike. One shows the casts of two occipital spines, which in the other are broken, but in the first the anterior part of the head is missing, while in the second this part is terminated by a straight line as in *A. mira*.

(II.) SECOND NOTE ON *TRIBRACHIOCRINUS CORRUGATUS*, RATTE, AND ON THE PLACE OF THE GENUS AMONG PALÆOCRINOIDEA.

TRIBRACHIOCRINUS CORRUGATUS, Ratte.

(PLATE XVI.)

Proc. Linn. Soc. N. S. W., Vol. IX. Part 4; Wachsmuth and Springer, "Revision of the Palæocrinoidea," Proc. Acad. Nat. Sc. Philad. 1879 to 1886 (1).

(1) Revision, Part I, Proc. Acad. Nat. Sc. Phil. 1879, p. 226.
,, Part II ,, ,, ,, ,, ,, 1881, p. 177.
,, Part III ,, ,, ,, ,, ,, 1885, p. 225.
,, Part III (Section 2) ,, ,, ,, 1886, p. 64.

This genus being hitherto entirely Australian, it will be suitable to complete the description that I have given of the second species known, by stating the opinion of Messrs. Wachsmuth and Springer, (whose "Revision of the Palæocrinoidea," has just reached its end), and the true place which, according to these gentlemen, the genus considered ought to occupy in the order Palæocrinoidea.

If we consider the calyx of a crinoid, we find that the base, to which the stem is attached, is composed of a certain number of plates. Let us take, for instance, *Cyathocrinus*, and *Tribrachiocrinus*, both represented in our Carboniferous. In *Cyathocrinus* the base is formed of five plates, and in *Tribrachiocrinus* of three plates, but in both cases the figure is a pentagon. In some genera the figure is an hexagon, though the former is the more frequent. The number of divisions, although most frequently five or three, is sometimes four or another number.

From these considerations the late Prof. Angelin divided the Silurian Crinoids of Sweden into four sections : Trimera, Tetramera, Pentamera, and Polymera. But the progress in the study of fossil crinoids, due principally to the authors of the 'Revision,' and to Dr. P. Herbert Carpenter, has led to a classification upon more natural principles. The last-named author in a paper on the 'Oral and Apical systems of the Echinoderms,' "considers the basals of recent crinoids to be homologous to the genital plates, and the radials to the ocular plates of the Echini, and he traces the homology to the Palæocrinoidea, in respect to which, however, he advances the opinion that the first ring of plates resting upon the upper stem segment, which have heretofore been nominated *basals* are in many types not basals at all. He regards the set of plates which lie next below the radials as the true *basals*, no matter whether they rest directly upon the stem, as in *Platycrinus*, or are separated from it by another ring of plates, as in *Cyathocrinus ;* so that the *sub-radials* of most American authors, or *parabasals*, as they are generally termed in Europe, are *basals* according to his view. The lowest or proximal ring of plates, in types having *sub-radials*, he calls *underbasals*, and these he believes to be unrepresented in the other types of Crinoids and all other Echinoderms." . . . .

"Carpenter's reasoning in regard to the basal plates is, that, as the genitals in the Echini, and the basals in most Palæocrinoids, which are generally considered to be their homologues, are situated *interradially* with regard to the general symmetry of the body, we must expect to find the genitals in Palæocrinoids in the same relative position; and that, in forms like *Cyathocrinus*, which have two rings of plates below the radials, the lower or proximal plates are situated in line with the radials, and hence cannot be the true basals. He holds that the same order of plates cannot be radial in one genus, and interradial in another. This argument is unquestionably a very strong one, and we (the authors of the "Revision") are enabled to confirm it by a number of interesting observations." (1)

Although I feel justified in giving these quotations, on the ground that they lead to a readily useful end in a new and better understanding of fossil crinoids, I cannot follow the authors in illustrating their numerous observations in support of Carpenter's views, and I beg only to record briefly a few simple instances.

It has been said that the basals must be *interradial* in position. Then in some genera which have no underbasals, but which have three irregular basals forming a pentagonal figure, namely, *Platycrinus* (fig. 1), *Symbathocrinus* and allied forms, it is necessary to show that these basals are interradial in position; this is done by supposing the two larger plates formed by the conjugation of two smaller pieces respectively; if, therefore, they are subdivided as shown by dotted lines, it will be understood that the resulting five pieces will be interradial in position. In *Belemnocrinus*, and in the recent genus *Rhizocrinus*, the basal pentagon is formed of five pieces, which are, therefore, naturally interradial in position. In *Eucalyptocrinus* and *Melocrinus*, the base of which is also a pentagon but composed of four plates, one being larger, this larger plate can be divided, and then all the basals become interradial in position.

(1) Revision, Part I. pp. 239, 240.

In *Actinocrinus* the basal disc has three plates forming an hexagon, and the subdivision of these plates will form six basals instead of five, but then the anal plate comes in as shown in the 'Revision' (pl. XV. fig. 4) requiring two plates, which may be considered equivalent to one, for its support, and the structure remains in principle the same as in the foregoing cases. Let us now consider forms provided with underbasals.

In forms like *Cyathocrinus, Rhodocrinus* (fig. 2), etc., in which the ring of plates next to the stem is formed of five segments, these plates are radially situated as underbasals, while the next ring is composed of the five basals interradially situated. In most of the *Ichthyocrinidæ* the lower ring is composed of three plates, but then, if we divide them by sutures into five, about equal plates, these five will be radially situated as underbasals, and exactly equivalent to the corresponding set of plates in *Cyathocrinus*, etc.

The authors of the 'Revision' continue as follows:—

"It is now a very important fact that these two rings of plates —the first radials and the interradial set of plates next below them—are the only ones which are found in *all crinoids from the earliest geological ages to the present time.* It thus appears that the evidence derived from the embryology of the Pentacrinoid, and the observed mode and order of development in the Palæocrinoids during individual life, is fully and beautifully confirmed by the geological history of crinoids."

"All this evidence seems to us (Wachsmuth and Springer) to be conclusive, and to prove satisfactorily that the two rings of plates regarded by Carpenter as genitals and oculars, are the fundamental parts in the aboral side of the calcareous skeleton, and that the subsequent orders of radials and interradials are to be considered as supplementary to them, and as the products of growth in the individual and development in geological time."

"Our conclusions being thus in harmony with Dr. Carpenter's views, we think it both logical and expedient to adopt his terms, and call the first ring of plates below the radials *basals* in all cases, and the second ring below, or the proximal plates when there are two rings, *underbasals*, thus discontinuing the term *subradials* altogether." (1)

It is scarcely necessary to add that the arrangement of the plates and their symmetry will be fully understood, provided that the radials should be properly traced. If in a fossil crinoid we know the basals, we will say that the radials are "all the plates of the body above the basals, radially situated," (2) or in other words we will say that the radials are those plates not in contact with the stem which are situated in vertical line below the arm plates which determine the radiating figure of the animal.

In my description of *Tribrachiocrinus corrugatus* (3), I used terms previously adopted by different authors on crinoids, which are not only in discordance with the new terminology, (4) but are henceforth misleading. Therefore I beg leave to rectify them here.

At page 1160 I have given a schematic table of the arrangement of the different parts composing the outer structure of the calyx. In that table I used letters and signs to represent these different parts, as well as on plate 68. Therefore in perusing this table, together with the following corresponding terms, one will be enabled to understand the revised diagnosis of the genus as given by Wachsmuth and Springer. (5)

At page 1160 (Proc. Linn. Soc. Vol. IX. Part 4.)

Instead of:	*Read:*
Basal pieces	Underbasals
Sub-radial plates or First Costals	Basals
First anal plate or Intercostal	Azygous plate
Interradials or Interscapular, CD, EA.	Radials
Interradials : (B. † AB.)	Anal (the lower in the diagram pl. 68)
Second anal	Plate of ventral tube
Second Radials (marked at bottom of table by the sign †)	Brachials (three over the Radials BC., DE. and A. † AB.) and two probably ankylosed brachials over the Radials CD, and EA.

(1) Revision, Part I. p. 244.
(2) Revision, Part I. page 250.
(3) Proc. Linn. Soc. N.S.W. Vol. IX. part IV., page 1158.
(4) Revision, Part I. p. 249.
(5) Revision Part III. Sect. 2, p. 175.

To accompany this I give a revised figure of the diagram, and a correct sketch of one of the radials with probably ankylosed brachials as suggested by the authors of the Revision. (1) (Pl. XVI, figs. 3 & 4.)

The suggestion that the two radials symmetrically disposed are "compound plates, each representing a radial and a bifurcating brachial, which probably became ankylosed," (2) seems to me perfectly acceptable, but although I am not ready to discuss the opinions of, no doubt, the best authorities on crinoids, I may perhaps remark that the ankylosed brachials are very much reduced in size and thickness, and that, if, according to Messrs. Wachsmuth and Springer, "they evidently supported two arms, one at each side," these arms were probably abortive, or at any rate very much reduced, or reduced next to nothing, as I do not see any sockets for them, nor any strength to support them. This does not at all mean that the plates in question were not brachials, but that they probably became ankylosed through having lost their functions.

At p. 1163 (*l.c.*) I have spoken of small covering plates represented in plate 68, figs. 2 and 3. They are no doubt plates, as their impression appears distinctly on the outer as well as on the inner cast. In my paper, comparing these plates with those of the flattened vault in *Rhodocrinus* as represented in de Koninck's work, I took them to be vault plates. But, according to Wachsmuth and Springer (3) "if they are plates at all, they formed a part of the disk, and as such were covering pieces"—I cannot follow the authors in the study of pieces which are rarely observed in specimens of common occurrence, although of great importance in the classification. For this reason, and in consequence of the complicated arrangement of these pieces, the evidences given by previous writers are very confusing, and light is thrown upon the subject in Part III. of the 'Revision' in the chapter treating

(1) Revision, Part III. Sect. 2, pp. 174, 175, and plate VI. fig. 5.
(2) Revision, Part III. Sect. 2, p. 174.
(3) Revision, Part III. Sect. 2, p. 174.

of the "Interradial, Interaxillary and Interbrachial Plates" (p. 237), and in the chapter treating of the "Ventral Perisome" (p. 281).

Although it might appear natural to extract and include here the revised generic diagnosis of *Tribrachiocrinus*, I think that it does not sufficiently differ from my description, while it takes nearly the whole of page 175 of the 'Revision.' I think it more useful to give here a glance at the classification in order to point out the place of this genus in the Palæocrinoidea. I may remark here that I now use the revised orthography of the generic name which needs no comment, the first spelling being obviously erroneous.

The generic name *Tribrachiocrinus* was proposed by Professor M'Coy on the supposition that there were only three arms; but, if according to Wachsmuth and Springer, the two ankylosed brachials supported two arms each more than mere rudimentary, then our fossils would have had three large and four smaller arms. This being so, the name etymologically considered, is now a misnomer; nevertheless it conveys to the mind the notion that there were three conspicuous arms.

In the 'Challenger Report,' (Zoology, Vol. IV. pp. 149-154,) will be found, according to Dr. Carpenter, the distinctions between Neocrinoidea and Palæocrinoidea. Among these much stress is laid, according to the 'Revision' (1) upon the symmetry of the calyx in the Palæocrinoidea, which Carpenter attributes to the intercalation of an anal plate. To this there are many exceptions. But, among other differences there is one absolute, that in the Palæocrinoidea the mouth and disk ambulacra are completely closed, while in the Neocrinoidea the ambulacra have open food grooves.

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(1) Rev. Part III., p. 294.

The authors of the 'Revision' divide the Palæocrinoidea into three suborders (1) that I will arrange synoptically as follows :—

A. Plates of the test articulated : 2nd Sub-order ARTICULATA.

B. Plates of the test united by suture.
- Lower arm plates incorporated by means of interradial plates so as to form a part of the calyx. Underbasals frequently undeveloped, etc. — 1st Sub-order CAMARATA.
  - (2 families) Ex. : *Ichthyocrinus.*
  - (10 families) Ex. : *Platycrinus.*
- Arms free from the first radials. Calyx composed exclusively of basals, frequently underbasals, five radials, five interradials ventrally located, and one or two azygous plates, etc. — 3rd Sub-order. INADUNATA. (Sub-divided.)
  - Ventral covering consisting of comparatively few pieces. Disk subtegminal instead of being extended into a lateral sac, etc. — LARVIFORMIA. (4 families) Ex. : *Cupressocrinus*
  - Perisome partly or wholly exposed, the interradial plates either covering the perisome, or this partly covering them Portions of the disk penetrating the calyx posteriorly by passing out through the anal opening and forming either a balloon-shaped or a tubular sac, composed of well-defined plates etc. — FISTULATA. (10 families) Ex.: *Cyathocrinus* *Poteriocrinus* *Tibrachiocrinus* *Encrinus.*

Tribrachiocriuus had been broadly compared with *Cyathocrinus,* and its correct affinities had not been understood before they were made out by the American scientists who say in the Revision (2)—" The radials enclose the azygous plate proper, and an anal piece as in most of the Poteriocrinidæ. *Tribrachiocrinus* is not

(1) 'Rev.' Part III. Sect. 1, pp. 304, 305, 313-315.
'Rev.' Part III. Sect. 2, pp. 65, 66, 78, 81-82, 116, 117.
(2) 'Rev.' Part III. Sect. 2, pp. 174, 175.

such an aberrant genus as it was supposed to be. It is closely allied to *Cromyocrinus* and *Agassizocrinus*, and like them has large basals, comparatively small radials, and an unusually large azygous plate, followed by the anal piece and proximate plate of the ventral tube. It differs, however, from both genera in the number of underbasals, and the peculiarities in the radial regions which have been mentioned."

And of the genus *Cromyocrinus* (1) they say: "*Cromyocrinus* is closely allied to *Agassizocrinus*, to which it holds a similar position as *Pentacrinus* to *Antedon*. We doubt if *Cromyocrinus* ever became detached from its column, while all species of *Agassizocrinus* lose their column comparatively early."

In harmony with the above lines the authors say further in their diagnosis of *Tribrachiocrinus* "Column apparently small and circular."

In fine, according to these authors, our fossil is placed in the family *Poteriocrinidæ* which, in the subdivision *Fistulata* of the sub-order *Inadunata*, comes next to *Cyathocrinidæ*, and is followed by *Encrinidæ*.

Before ending this note I must add to the description of *Tribrachiocrinus corrugatus* a detail which is supported by a closer examination of the original, namely that the ridges are provided along their summits with a line of small tubercles, and that the isolated tubercles support ordinarily a smaller tubercle at their summits.

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(1) Part III. Sect. 2, p. 171.

(III.) NOTE ON TWO NEW FOSSIL PLANTS FROM THE WIANAMATTA SHALES. (1)

Jeanpaulia (?) palmata sp. nov.

(Plate XVII.)

I do not think I shall exaggerate, when I say that the specimen in the Australian Museum, which is here represented, is the most beautiful specimen of the most singular genus of fossil plants ever found in Australia.

A single frond is nearly 10 inches broad and nearly one foot from the top to the lower end of the stem, which seems as if it were still attached to the soil by its root. The general outline is that of a palmate leaf, and the number of divisions is not less than 58, reckoning the principal, secondary, and minor sub-divisions.

But before proceeding any further I must guard against hastily referring this plant to any known genus. At first I thought I could identify it with *J. bidens*, T. Woods (2) from the Burnett River coal seams, but similar plants have been several times shifted into widely different orders before evidence could be produced of their organs of fructification. Count de Saporta (3) has included *Jeanpaulia* and *Baiera* together as ferns, but this last genus is now considered to be coniferous.

Our specimen has a well proportioned stem, vertical, slightly curved at the base, gradually expanding at the top and giving rise to a palmate frond formed of divisions radiating from a centre to the periphery of a half circle.

The lateral sub-divisions or rays are from $4\frac{1}{2}$ to $5\frac{1}{2}$ inches long, and gradually increase in length to the apex, where the longest is 7 inches from the centre.

The frond is divided into about twelve principal rays at from five to twenty millimetres from the origin. One of these divisions seems to begin far higher (apparently the tenth from the left), but it might

(1) Mr. Wilkinson has suggested to me that these might belong to the Hawkesbury Sandstone.

(2) On the Fossil Flora of the Coal Deposits of Australia, Linn. Soc. N.S.W. Vol. VIII. Part 1, p. 132, pl. 4, fig. 3.

(3) Paleont. franc. Terr. juras. Veg. Tome I. p. 161.

be due to a mistake in recording them, by reason of the divisions covering each other. Then at a distance of four centimetres more or less from the centre, a secondary sub-division occurs, and each of the rays thus formed is again divided at an average distance of from five to eleven centimetres from the centre, the average sub-division taking place at seven or eight centimetres. Each of these sub-divided rays is obtuse, rounded or digitiform at the apex. They are not as a rule equal, but their length follows the general outline of the frond. Some of the principal rays, however, (apparently the fifth and the ninth) seem to have their divisions shorter (the ninth evidently), than the proximal ones. The principal sub-divisions are not all regularly dichotomous, but those in the middle (apparently from the fourth to the eighth from the left) have some of their ultimate divisions in three instead of two parts, and this slightly changes the form of the apex, which is sometimes narrower, less obtuse, and bent or slightly incurved on one side. The width of the ultimate ordinary sub-divisions is from 4½ to 10 millimetres, and in the secondary rays which have three sub-divisions, they are still narrower, being from 3 to 5 millimetres.

The following table will give as far as possible the measurements and number of divisions, the principal rays being numbered as before from the left, from 1 to 12 :—

No. of Order of principal ray.	Number of divisions and sub-divisions.	State of preservation.	Length.
1	2 × 2	entire	145 mm.
2	2 × 2	broken	?
3	2 × 2	broken	?
4	2 × 3	entire	165
5	2 × 3	partly broken	150 (about)
6	2 × 3	broken	?
7	2 × 3	entire	160
8	2 × 3(4)	partly broken	165
9	2 × 2	entire	155
10	2 × 2	partly broken	165
11	2 × 2	entire	135
12	2 × 2	entire	120

(1) There seem to be here, only five instead of six ultimate sub-divisions.

The frond is seen from its upper surface which is coriaceous, bright, nearly smooth, and has the external appearance of some leaves of *Calamus.* This upper surface is covered with longitudinal venations slightly marked, some, however, irregularly disposed, being more conspicuous; the under surface, on the contrary, shows by its impression that the venation was very regular and very close, the distance between the veins being less than half a millimetre.

Although the ultimate bidental subdivisions of the frond is very much like that in *Jeanpaulia bidens*, T. Woods, there is a feature in our plant which would strongly militate against its being a fern. It is that the frond seems as if it were split, as happens in some conifers and palms. It is indeed very difficult to see the point of separation of the divisions, and I could not see any bifurcating vein there.

According to de Saporta (l.c., p. 463)—" Les *Jeanpaulia* et *Baiera* se montrent avec le Rhétien à l'extrême base du Lias Inférieur; ils reparaissent ensuite dans l'Oolithe et leur existence se prolonge jusque dans le Wéaldien. Si l'on maintient la distinction des deux genres, il semble que les *Jeanpaulia* règnent seuls dans l'Infra-Lias, qu 'ils sont associés aux *Baiera* dans l'Oolithe et que ceux-ci leur survivent dans le Wéaldien. Au total, les *Jeanpaulia* constituent un groupe essentiellement Jurassique."

By coincidence it happened that Mr. R. M. Johnston, F.L.S., read lately before the Royal Society of Tasmania, a paper entitled " Fresh contributions to our knowledge of the plants of Mesozoic age in Tasmania," (1) in which the author, among other plants from the coal seams at Newtown (Jerusalem Coal Basin), describes a species of *Baiera* (*B. tenuifolia*, Johnston), which he considers as a conifer. It has not a palmate frond like *Baiera digitata* (Brngt.) Schenk, (2) and has more the outline of *Jeanpaulia Munsteriana* (Presl.) Ung. on a smaller scale, while the leaves are narrower comparatively than in this last plant.

Mr. Johnston had the kindness to send to the Museum the following new species, including his *Baiera* :— *Thinnfeldia*

(1) Proc. R. S. Tasm. Oct. 11, 1886.
(2) Schimper l.c., p. 423.

odontopteroides var. *obtusifolia*, *Sagenopteris salisburoides*, and *Rhacophyllum coriaceum*, which can be seen in the Museum.

CYCADOPTERIS (?) SCOLOPENDRINA, n. sp.

(Plate XVI. fig. 5.)

The other fern represented resembles the genus *Cycadopteris*, Zigno (1), and also *Lomatopteris*, Schimper (2), to which this last author, (according to Saporta) has wrongly referred some true *Cycadopteris*.

In both genera the frond is thick, and the pinnules are not deeply incised, their confluence taking place at a distance from the rachis; and also in both genera the pinnules are thickened by a border, the true nature of which, as distinguishing the two genera from each other, it is difficult to understand from a fossil in which the characters have been obliterated by pressure, but which is compared by Zigno to that in *Myriopteris* (*Cheilantheæ*).

There is also a great difference in the mode of venation, which in *Lomatopteris* is reduced to a single principal vein in each pinnule, while in *Cycadopteris* there is a secondary nervation.

Our fossil also resembles some species of *Odontopteris*, and some of *Pecopteris* from which it is distinguished by the thick border.

As this fossil is represented in the Museum by only a single specimen, I could not spare much of it for an examination of the hidden under-surface in order to ascertain whether there were secondary veins or not, which would place it as *Cycadopteris* in the first, or *Lomatopteris* in the second case. This examination failed to distinctly prove the presence of a secondary nervation, although the fragmentary appearance of the frond would make it difficult to ascertain it beyond doubt. In one of the pieces examined, the principal vein of the pinnule was distinct enough, and no vein was seen to spring from it. But as I have said above, the fleshy frond is entirely transformed into coal, which is much fractured into geometrical fragments as shown in fig. 7; and it would be

(1) Saporta, l.c, p. 417. Schimper, l.c., I. p. 472.
(2) Saporta, l.c., p. 391. Schimper, l.c., p. 472.

impossible to have recourse to the delicate macerations which would have resulted in the separation of the epidermis for microscopical examination through transmitted light, as Saporta did. (1)

Among the *debris* of plants from the Wianamatta shales, from which Mr. Whitelegge makes such beautiful slides, it might not be impossible to find some thinner fragments of the same plant in which it would be more easy to distinguish the venation.

For the diagnosis of the two genera under notice, I will do no more at present than refer to the authors already quoted, but I will extract from Saporta's work his own untranslated interpretation of the border of the pinnules.

At p. 395 he says—" Evidemment voisins des *Cycadopteris*, . . les *Lomatopteris* s'en distinguent et par l'absence de nervures secondaires dans chaque pinnule et aussi par le repli marginal, remplacé chez le premier de ces genres, ainsi que nous avons pu nous en assurer, par un ourlet (hem ?) cartilagineux où viennent se perdre les veines sorties de la médiane." And at p. 419—" Le bourrelet (pad ?) cartilagineux qui sert de marge aux pinnules des *Cycadopteris* constitue aussi un caractère fort net empêchant qu'on ne puisse confondre ce genre avec celui des *Pachyteris*, &c. . . . ou bien enfin avec les *Lomatopteris* dont la bordure résulte d'un repli de la marge, &c."

Lastly I will add that the character which induced me in the first instance to regard the fossil as more likely allied to *Cycadopteris* than to *Lomatopteris*, in presence of the uncertainty as to the existence of a secondary nervation, is, that the border appears visible on the upper surface of the frond as a duplication or a folding of the epidermis, but when the under surface is disengaged, the border is seen also as a hem. As no specimens are available here for comparison, I give an enlarged section of what can be seen (fig. 6 bis) of that border which, in the meantime, leaves the identification a doubtful matter.

I intended to give a provisional description of one of the fishes found with these plants, which has already been exhibited before the

(1) l.c. p. 393.

Society, the specimen being beautifully preserved and apparently one of the *Palæoniscidæ*, but of puzzling affinities. I have, however, not yet found sufficient works of reference on the subject.

Although the fins provided with fulcra, and the scales remind us of some species of *Palæoniscus*, the tail does not seem a perfectly heterocercal one, and resembles, in some respects, and on a superficial examination, that of a fish widely separated from it in other respects, viz., *Lepidotus*, which is understood to have had an homocercal tail. The rays of the tail and fins are divided at about half their length into fan-shaped expansions, as shown distinctly in Agassiz's fig. of *Lepidotus* (Vol. 1, tab. C.), in *Megalurus* (Vol. 1, tab. E), in some species of *Palæoniscus*, and in other fishes.

With this fish are found some others of the same family, and the well-known *Cleithrolepis granulatus* of the Hawkesbury sandstone.

I may also add that the plants found with these fishes include also a specimen of *Thinnfeldia odontopteroides*, and that the genera *Jeanpaulia* and *Cycadopteris* or *Lomatopteris*, to which they are supposed to belong, are considered as Jurassic in Europe. The first one, however, is also found in the Rhætic, which is considered as Triassic ; and the second may likewise have come into existence in the Trias also, (since it would not be the first instance where plants have failed to determine the age of a formation) if more importance than necessary was given to its being considered Jurassic in Europe, as above stated.

EXPLANATION OF PLATES.

Plate xv.

Fig. 1.—*Proetus Ascanius (?).* × 2.
Fig. 2.—*Proetus Ascanius (?).* A smaller specimen. × 2.
Fig. 3.—Head of same without the movable cheeks. × 2.
Fig. 4.—Pygidium (probably of same species). × 2.
Fig. 5.—Part of body of *Acidaspis Verneuili (?)* drawn from a specimen (the largest Australian trilobite) in Mr. J. Mitchell's collection, Bowning. Natural size.
Fig. 5 bis.—Head of *Acidaspis Verneuili (?)* corresponding to a smaller specimen.

Fig. 6.—Section *a b*, of part of the axis.

Fig. 6 bis.—Sections *m n*, of part of the pleuræ.

Fig. 7.—One of the principal tubercles surrounded by smaller ones. × 5.

Fig. 8.—Junction (articulation ?) of the axis with the pleuræ. × 2.

Fig. 9.—Small barbed spines placed on the front of each of the large spines.

Fig. 9 bis.—Same. × 2.

Fig. 10.—Pygidium of *Acidaspis Verneuili*. × 2.

Fig. 11.—Head and pleuræ of *Acidaspis* near *A. Prevosti*. × 2.

Fig. 12.—Pygidium of *Acidaspis* near *A. Prevosti*. × 2.

Fig. 13.—Head of *Acidaspis* near *A. mira*. × 2.

Fig. 14.—Head of *Acidaspis* near *A. mira*. × 2.

Fig. 15.—Pygidium of *Lichas sinuata*, n. sp., drawn twice natural size, from silicified specimens in the Australian Museum. From the limestone near the Wellington Caves.

All the specimens here represented are, unless otherwise stated, from Mr. Mitchell's collection; No. 14 given by him to the Museum.

PLATE XVI.

Fig. 1.—Example of a crinoid *(Platycrinus)* with the true basals *(b)* as proximal plates; *r* one of the radials.

Fig. 2.—Examples of a crinoid *(Rhodocrinus)* with five underbasals *(u)* as proximal plates; *r* one of the radials.

Fig. 3.—Diagram of *Tibrachiocrinus corrugatus*, Ratte; showing three underbasals (*u*); five basals (*b*); three radials (*r*) articulated with three brachials (*br*), each of which supports a strong arm; two radials (*r″*) with ankylosed brachials, each of which supports two weak or abortive (?) arms; an azygous plate (*a*); an anal plate (*x*), and a ventral tube (*t*).

Fig. 4.—One of the radials with ankylosed brachial supporting probably two arms.

Fig. 5.—*Cycadopteris (?) scolopendrina*, n.sp., from the Wianamatta Shales, natural size, from a specimen given to the Australian Museum by Mr. Harber.

Fig. 6.—Pinnules enlarged twice, showing the border.

Fig. 6 bis.—Section of same.

Fig. 7.—Part of surface enlarged to show regular mode of fracture of the fleshy parenchyma transformed into coal.

Fig. 8.—*Baiera tenuifolia*, Johnston, a coniferous plant from the Jerusalem Coal Basin, Tasmania, natural size, from a specimen in the Australian Museum given by Mr. R. M. Johnston, F.L.S.

PLATE XVII.

Jeanpaulia (?) palmata, n. sp., from the Wianamatta Shales, natural size, from a specimen in the Australian Museum, given by Mr. Harber.